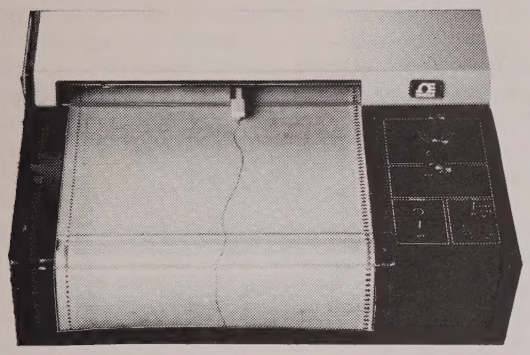
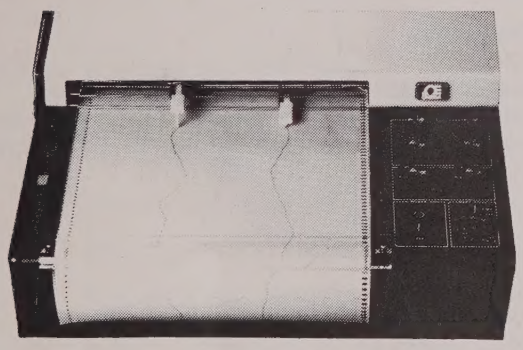


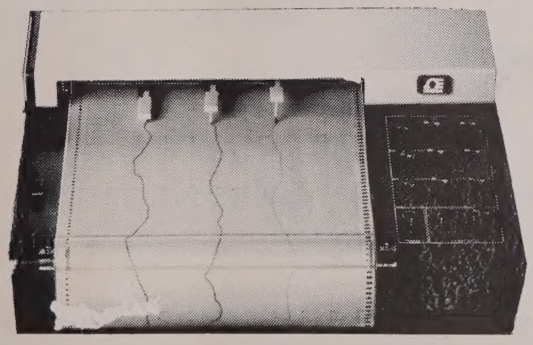
SERIES 500

Deluxe Laboratory Chart Recorder

PEACH Calibration, Inc.
RT. 2, BOX 141-C
McMINNVILLE, OREGON 97128
(503) 472-1860



Operator's Manual



OMEGA ENGINEERING, INC.
An OMEGA Group Company

WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of one (1) year from date of purchase. If the unit should malfunction, it must be returned to the factory for evaluation. Our Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive current, heat, moisture, vibration, or misuse. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

THERE ARE NO WARRANTIES EXCEPT AS STATED HEREIN. THERE ARE NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL OMEGA ENGINEERING, INC. BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES. THE BUYER'S SOLE REMEDY FOR ANY BREACH OF THIS AGREEMENT BY OMEGA ENGINEERING, INC. OR ANY BREACH OF ANY WARRANTY BY OMEGA ENGINEERING, INC. SHALL NOT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER TO OMEGA ENGINEERING, INC. FOR THE UNIT OR UNITS OR EQUIPMENT DIRECTLY AFFECTED BY SUCH BREACH.

Return Requests/Inquiries

Direct all warranty and repair requests/inquiries to OMEGA Customer Service Department, telephone number (203) 359-1660. Before returning any instrument, please contact the OMEGA Customer Service Department to obtain an authorized return (AR) number. The designated AR number should then be marked on the outside of the return package.

To avoid processing delays, also please be sure to include:

1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

OMEGA ENGINEERING, INC.

One Omega Drive, Box 4047
Stamford, Connecticut 06907-0047
(203) 359-1660 Telex: 996404 Cable: OMEGA FAX: (203) 359-7700

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SECTION 1 INTRODUCTION

1.1 GENERAL DESCRIPTION

The OMEGA® Model 555, 585, and 595 Deluxe Laboratory Chart Recorders are dc analog recorders--a product of advanced electronic techniques. The solid state modular circuitry yields high performance and reliability. The Model 555, 585, and 595 are one, two, and three channel recorders, respectively.

These graphic recorders may be used in many different applications such as in the medical, teaching, and industrial fields--where a precision instrument is of utmost importance.

Inputs such as dc voltage, current, temperature (via thermocouples), and a variety of other variables can be measured by these recorders.

NOTE

Except where specifically noted, the information in this manual is common to all three models.

The recorder consists of a cabinet assembly, operating controls and indicators (refer to Table 3-1), and an electrical system equipped for power conversion, a pen drive system, and a chart drive system.

1.2 FEATURES

The Laboratory Chart Recorders provide the following features:

- o One (Model 555), two (Model 585), or three (Model 595) channel recorders
- o Multiple chart speeds
- o Multiple span ranges
- o Disposable fiber-tipped pen
- o Fully adjustable from 0 to 100% of full-scale
- o 1 mV to 50 V - variable attenuator
- o 0.5 second pen response
- o Crystal controlled stepper chart drive
- o Pulse-modulated servo system

1.3 OPTIONS

1.3.1 Mechanical Event Marker*

When a contact closure is made between pins 1 and 2 of the remote control connector, the mechanical event marker uses a separate, solenoid-actuated pen assembly to provide a short mark at the left edge of the chart.

* Not available with the three channel recorder.

1.3.2 Electric Pen Lift

When a closure is made between pins 8 and 9 of the remote control connector, an internal solenoid electrically lifts the recorder pen off the recorder chart.

1.3.3 Override Event Marker

When a contact closure is made between pins 3 and 4 of the remote control connector, this event marker produces a "glitch" in the pen trace. (Standard on channel 1 of all models.)

1.3.4 1000% Zero Suppression (Uncalibrated)

Provides the ability to suppress up to 10 times the selected input range to allow expansion and better resolution of a part of the input signal. Continuously adjustable using ZERO control.

SECTION 2 INSTALLATION

2.1 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, please call OMEGA Customer Service Department at (203) 359-1660.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

NOTE

The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

2.2 CHECKING THE FUSE

Check the instrument to ascertain that the proper fuse has been installed. The fuse is located on the back panel of the recorder. When shipped, the fuse is factory installed for either 115 or 230 V ac operation. A 0.3 A slo-blow fuse is used for 115 V ac operation (0.6 A for three channel recorder); a 0.15 fuse is used for 230 V ac, 50 to 60 Hz operation (0.3 A for three channel recorder).

2.3 POWER REQUIREMENTS

The recorder is designed to operate on 115 or 230 V ac at 50 to 60 Hz, single phase.

CAUTION

Be sure to set the 115/230 Volt Selector switch (Figure 3-1, item 14) to the correct line voltage.

2.4 GROUNDING REQUIREMENTS

For best performance, the green (or green and yellow) ground wire from the power cord and the signal source should share a common earth ground. The green (green and yellow) wire, in the power cord, is connected to the recorder ground (chassis); but not to the signal input. If the signal input does not have a third wire in its power cord, or if the instrument is not grounded, connect a wire between the recorder ground (green terminal), and the chassis of the signal source.

In case of large common-mode signals, particularly 120 Hz, connect the recorder ground (green terminal) to the source of the common-mode signal, or to the negative recorder input (black terminal).

2.5 INPUT SIGNAL REQUIREMENTS

This instrument requires a dc voltage input.

Signal sources with current outputs will require that a shunt resistor be placed across the + (red) and - (black) inputs. Ohm's law may be used to compute the proper value for a given input range. The formula is:

$$R = \frac{E}{I}$$

Where E is the recorder span range selected in volts.
I is the maximum current signal to be recorded in amps.
R is the resistance of the shunt resistor in ohms.

Electrical connections are made as follows:

Signal source positive to the recorder red (+) terminal.
Signal source negative to recorder black (-) terminal.

Right-hand chart zero is standard on the recorder. Positive signals drive the pen to the left. If an opposite presentation is desired, reverse the input leads and use the zero adjust control to position the pen at the opposite side of the chart. Negative signals will now drive the pen to the right.

NOTE

This unit is calibrated for right-hand zero. Reversal of the input leads may yield a 3% full-scale error.

2.6 CHART PAPER INSTALLATION

To install the recorder chart paper, follow the directions listed below:

1. Remove the masking tape from new roll of chart paper. Cut or tear each side to form a blunt point at the center. (Do not fold.)

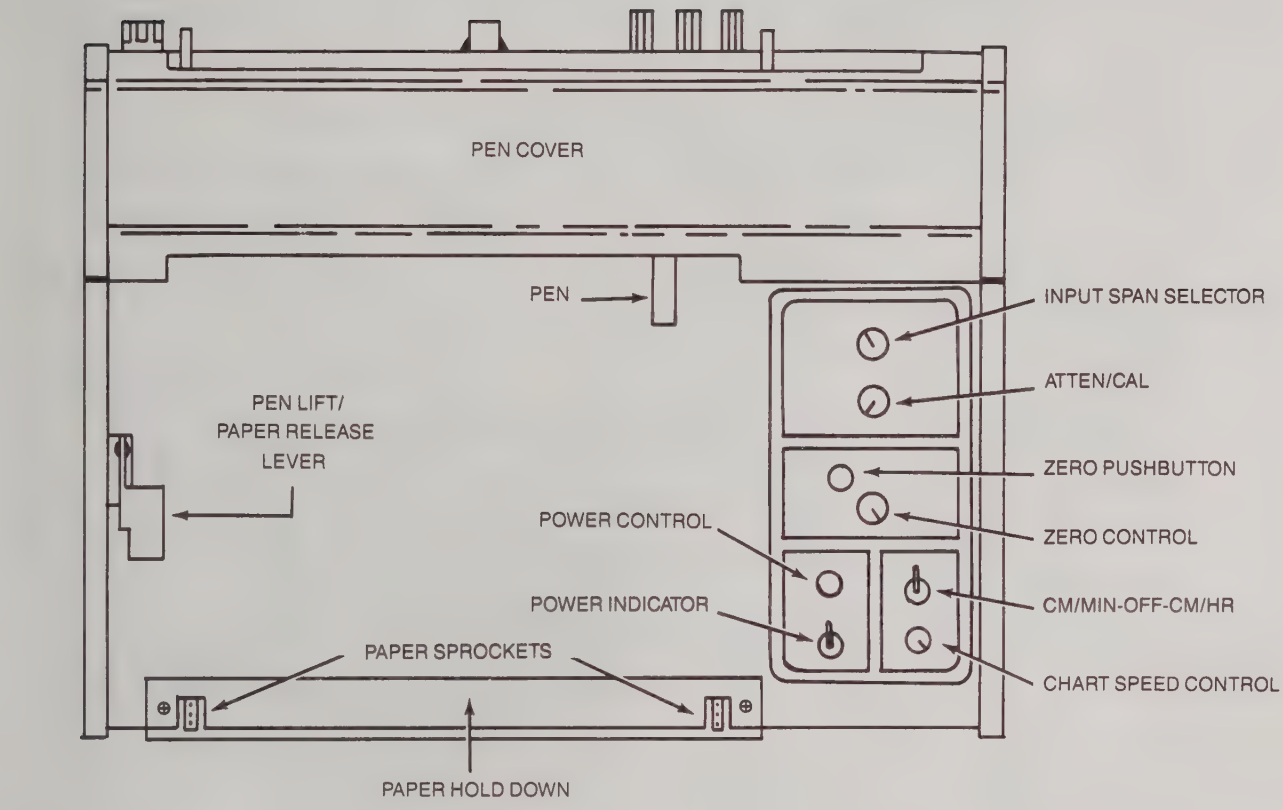
2. Pull the knob on the right side of the chart paper core support. The knob is located on the rear panel of the recorder (Figures 2-1 through 2-3). Install the paper so that it seats evenly on the two core supports. Release the knob.

3. Lift up the pen lift lever (on the left side of the instrument) to the full upright position.

4. Manually feed the pointed paper under the pen cover and across the writing area.

5. Pull the paper under the paper holder and across the paper sprockets. Make sure that the holes in the paper sit evenly on the sprockets.

6. The paper is now loaded for operation.



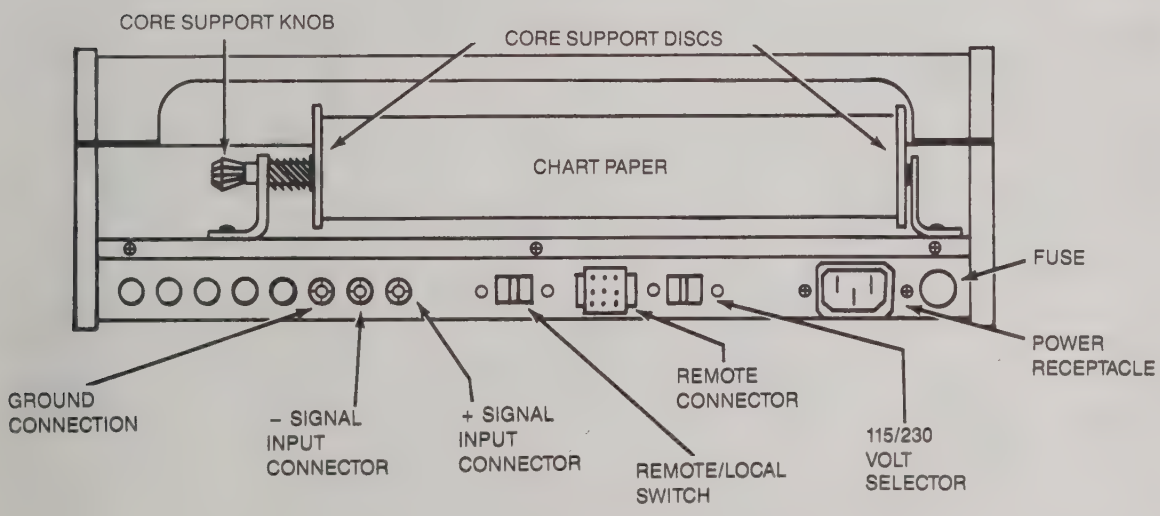


Figure 2-1. Paper Installation, Model 555 (Single Channel)

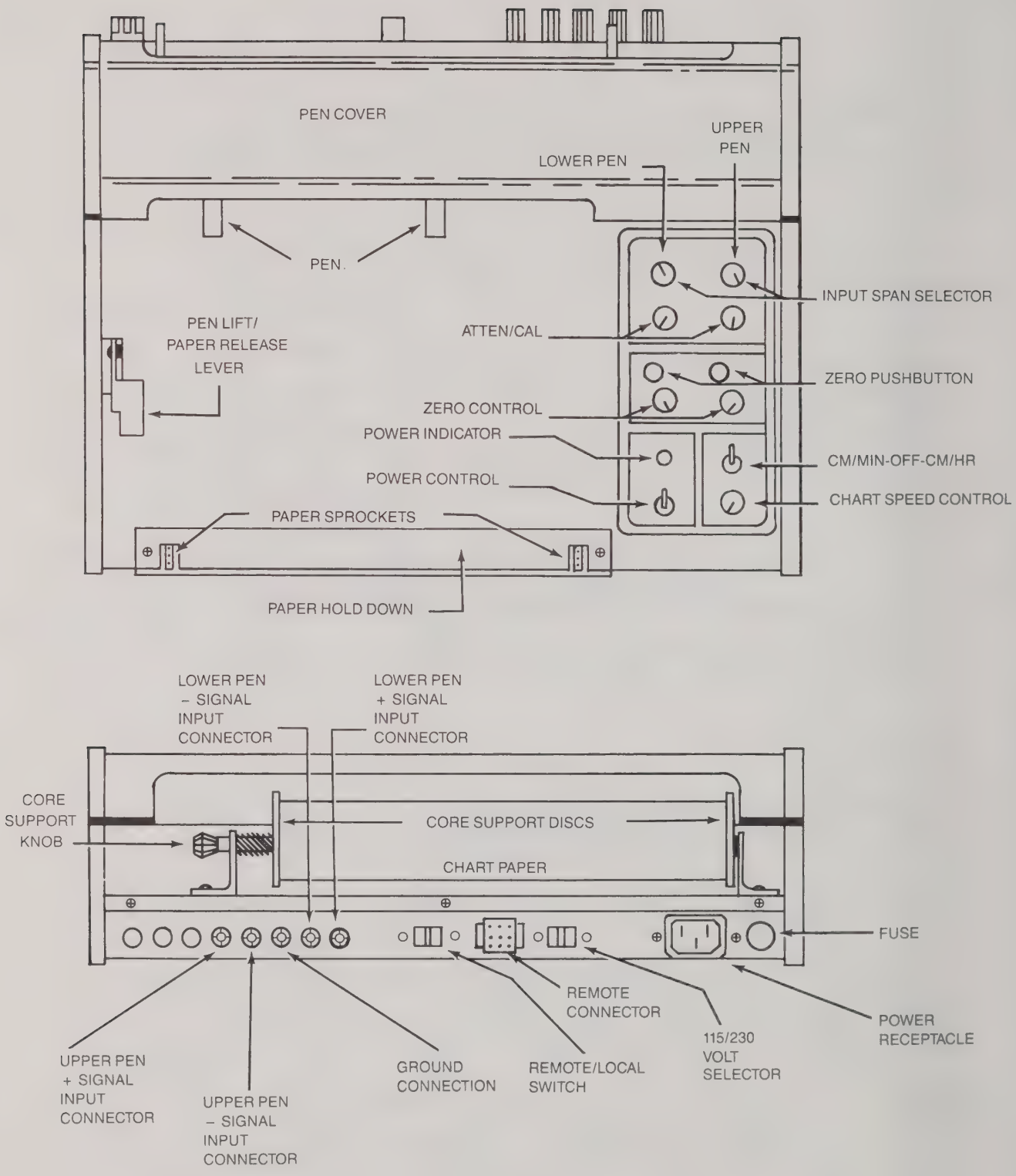


Figure 2-2. Paper Installation, Model 585 (Dual Channel)

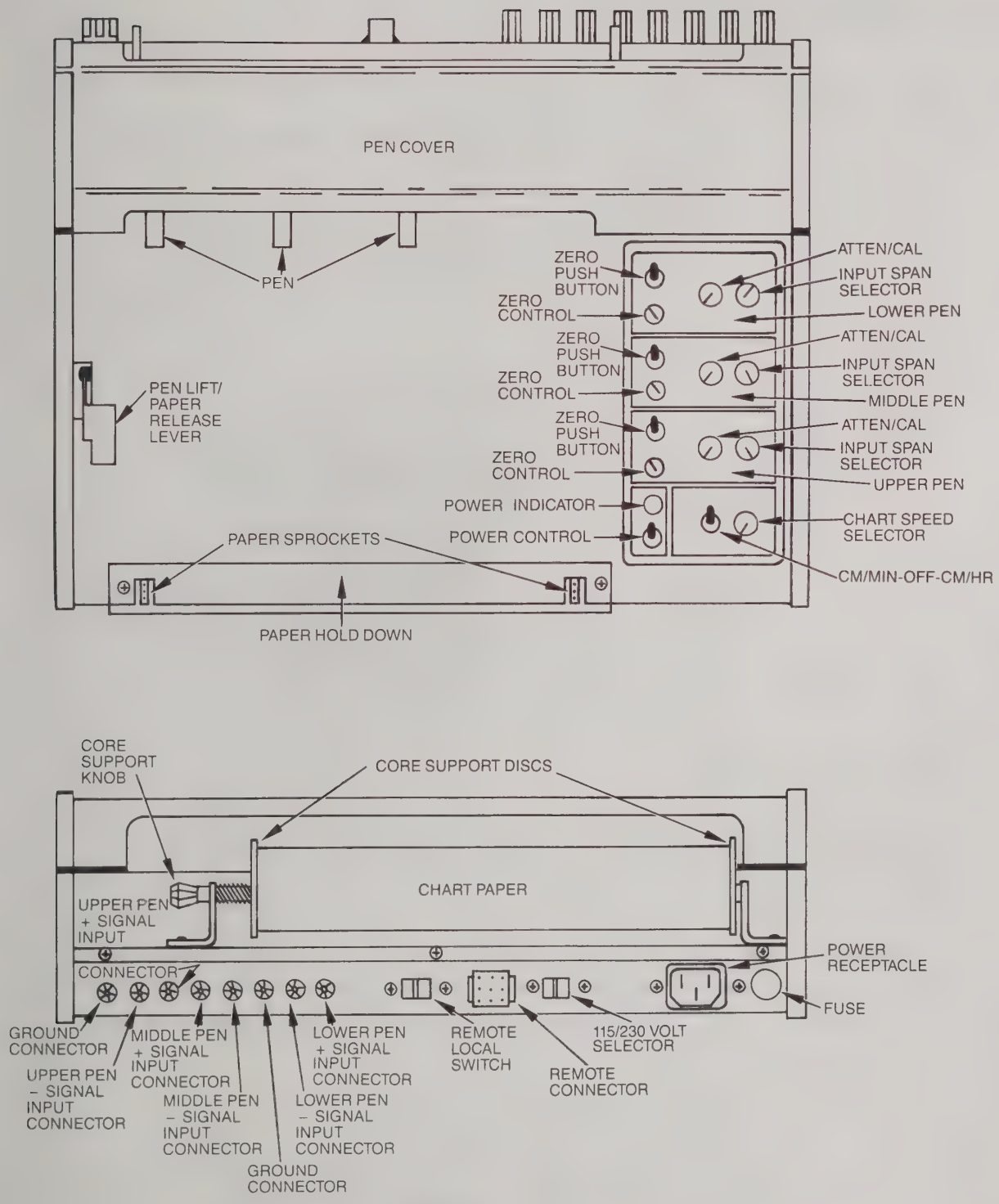


Figure 2-3. Paper Installation, Model 595 (Three Channel)

2.7 PAPER RELEASE CLUTCH

The recorder is equipped with a paper release clutch to manually advance or rewind the paper.

To manually advance or rewind the paper:

1. Lift the pen lift lever to the full upright position.
2. The paper may now be moved forward or backward as desired.

NOTE

After the manual advancement or rewind, there may be a few seconds delay before the chart begins to run at the selected rate of speed.

The chart recorder runs at speeds ranging from 1 cm/min. to 30 cm/hr. at multiple spans ranging from 1 mV to 5 V. The instrument is equipped for operation at either 115 or 230 V ac at either 50 or 60 Hz.

2.8 PEN INSTALLATION

Pen installation is accomplished quickly and easily by completing the following procedure:

1. Remove the pen cap and store it in a safe location.
2. Slide the pen into the pen carriage and gently push the pen back until the pen nib is firmly seated against the carriage.
3. Push the pen lift lever down.

NOTE

Although the pen can be left uncapped for a long period of time, it is advisable to cap the pen when it is not in use to prevent the pen from drying out.

SECTION 3 OPERATION

3.1 RECORDER CONTROLS AND INDICATORS

Figure 3-1 and Table 3-1 graphically illustrate and describe the controls, and indicators on the OMEGA Laboratory Chart Recorder. For further reference see Figure 2-1, 2-2, and 2-3.

NOTE

The controls, and indicators are illustrated for the Model 555 single channel recorder. Except as noted, these controls are common to all three models.

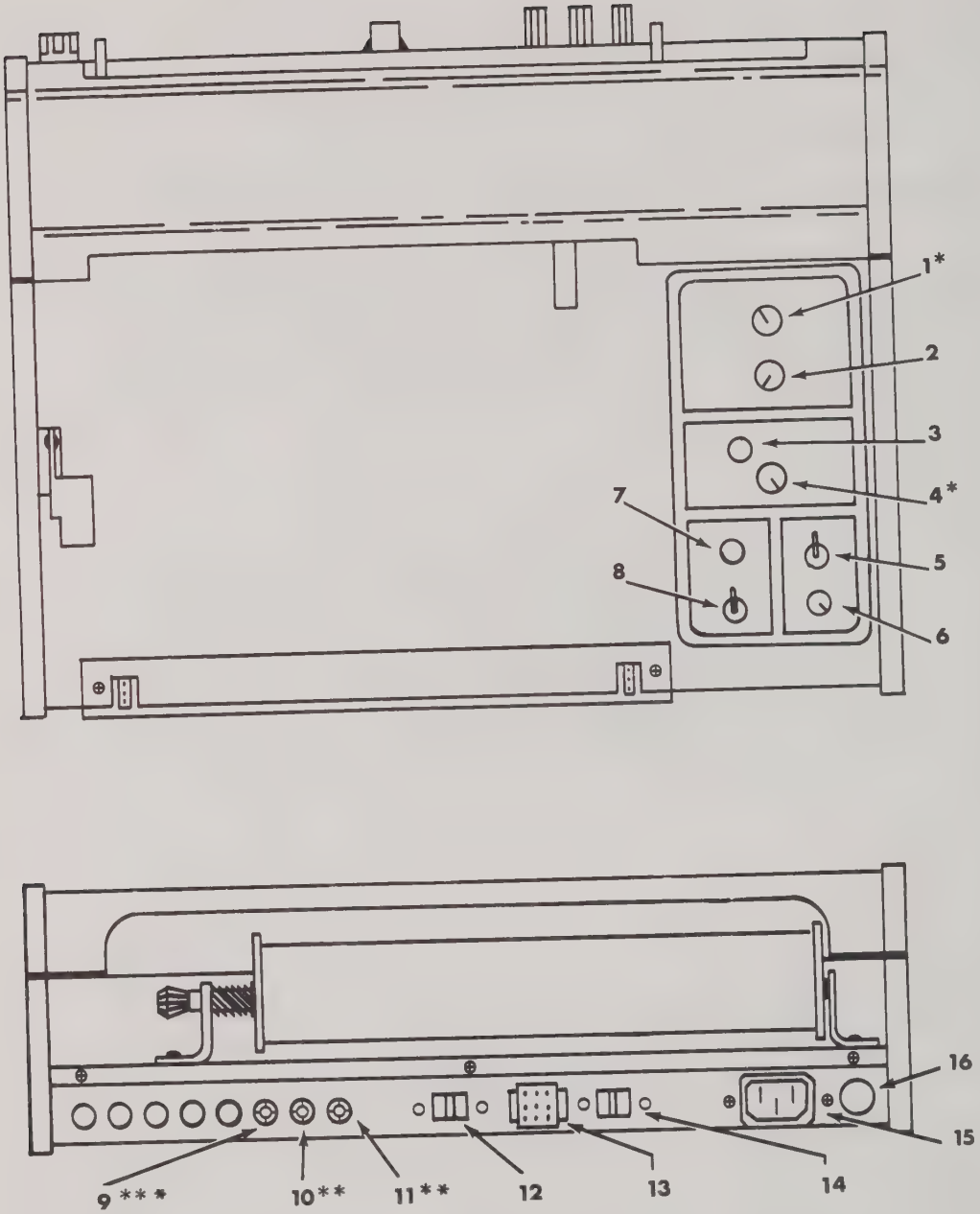


Figure 3-1. Controls and Indicators

* One control for each channel.

** One positive and one negative signal input connector for each channel.

*** Single and dual channels have one ground; three channels have two grounds

TABLE 3-1

CONTROLS AND INDICATORS

ITEM NO.	CONTROL OR INDICATOR	FUNCTION
1	INPUT SPAN selector rotary switch	Permits the recorder to operate at a specified input level. The 12 position rotary switch can be set to the following input levels: 1 mV, 2 mV, 5 mV, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1 V, 2 V, and 5 V (on each channel).
2	ATTEN/CAL rotary control	When the ATTEN control is rotated up or down, the input signal is attenuated (increased or decreased) to deflect the pen upscale or downscale. This control establishes the full-scale (left-hand) margin. When the control is set to position CAL, the input signal is "zeroed-out" to set the zero (right-hand) margin on the recorder chart.
3	ZERO push-button	Control must be pressed, and held, to set zero baseline. This control is used with the ATTEN/CAL and ZERO controls.

TABLE 3-1 (CON'T)

ITEM NO.	CONTROL OR INDICATOR	FUNCTION
4	ZERO control	Rotary switch is used in conjunction with both the CA and the ZERO push-button controls to deflect the pen zero on the chart paper (set zero; right-hand margin) for each channel.
5	CM/MIN.--OFF--CM/HR. control	A three position toggle swit is used to set the chart speed, or to turn the chart drive motor OFF. Setting this control to position CM/MIN. or CM/HR. drives the chart at the rate selected by the Chart Speed control (item 6, this Table) For example, setting this switch to the CM/HR. positio and the Chart speed control 12, will drive the chart at rate of 12 centimeters/hour.
6	Chart speed control	Establishes the rate at whic the chart will be advanced. Used with the CM/MIN.--OFF--CM/HR. control to drive the chart a certain distance per minute or per hour.

TABLE 3-1 (CON'T)

ITEM NO.	CONTROL OR INDICATOR	FUNCTION
6 (Continued)	Chart speed control	Available settings on this control include settings at: 1, 2, 3, 4, 5, 6, 10, 12, 15, 20, and 30.
7	Power Indicator	Illuminates when power is applied to the instrument.
8	POWER control	Two position toggle switch is used to turn the recorder ON and OFF.
9	Ground Connector	Connects the Recorder to ground. There are two such connectors on the three channel recorder.
10	Negative Signal Input Connector	Receives the negative signal input from the instrument to which the recorder is connected. (There are two such connectors on the two channel recorder and three on the three channel recorder.)
11	Positive Signal Input Connector	Same as item 10, (this Table) but receives positive signal.
12	REMOTE/LOCAL switch	In position REMOTE, the recorder chart operation can be operated from a remote location.

TABLE 3-1 (CON'T)

ITEM NO.	CONTROL OR INDICATOR	FUNCTION
12 (continued)	REMOTE/LOCAL switch	In position LOCAL, the chart is operated directly from the recorder.
13	Remote Connector	Signals are input for remote operation through the use of this connector.
14	115/230 Volt Selector switch	The switch must be placed in the appropriate position to accommodate the power source.
15	Power Receptacle	Receives one end of a double plug power cord to admit ac power to the recorder.
16	Fuse	Protects the recorder against power over-loads. Be sure to use the appropriate fuse as documented in paragraph 2.2.

3.2 OPERATING PROCEDURE

1. Plug the recorder into the wall outlet.
2. Confirm that the 115/230 Volt Selector switch is set to its proper position.
3. Set the POWER switch to position ON.

NOTE

If high accuracy and stability of recording are required, allow the recorder to warm up for approximately 30 minutes before proceeding with operation.

4. Set the CM/MIN.--OFF--CM/HR. control to position OFF.
5. Set the INPUT SPAN selector switch to the desired range.
6. Set the ATTEN/CAL control to position CAL.
7. Press the ZERO pushbutton in, and hold it in that position.
8. Rotate the ZERO control (for the appropriate channel in a multi-channel recorder), until the recorder pen has been set to zero on the chart paper. Release the ZERO pushbutton control.
9. Apply an input signal (of a known value) to the recorder.
10. Move the INPUT SPAN selector switch to each position in turn (working from lowest to highest) and observe the full-scale pen deflection. When the pen has been deflected off-scale (overrange), back off the control one setting, or until the pen is closest to the appropriate full-scale margin, but does not go off-scale.
11. Using the ATTEN/CAL control in position ATTEN, set the full-scale at its appropriate position. Remove the input signal.
12. Set the CM/MIN.--OFF--CM/HR. control to the appropriate rate.
13. Set the Chart Speed control for the appropriate chart speed.

NOTES

1. Make certain that the chart paper holes are properly aligned on the sprocket teeth.

2. When switching from one sensitivity range to another, it may be necessary to rezero the pen. To do so, press the ZERO pushbutton and readjust the zero control. (The zero control has no stops at the end of mechanical travel.)

3. In most models, the input resistance is sufficiently high so that the pen may drift when no connections are present at the input.

4. If the pen is physically stalled on the chart for a few seconds, the servo system will shut down to protect the motor. The best way to reset the system is to turn OFF the recorder for about five seconds; then turn it on. The pen should reactivate and continue to record normally.

5. If the shutdown resulted from an overrange, the recorder will operate normally as soon as the input signal decreases to a level which is within the selected span range.

3.3 UTILIZING THE REMOTE CHART CHANNEL

The remote chart channel can be used to run the chart drive from a remote location. To do so, set the REMOTE/LOCAL switch to position REMOTE. Attach a contact closure between pins 5 and 6 on the remote control connector. The remote control connector is located on the rear panel of the recorder. The chart will stop when the contact is opened.

3.4 HOOKUP FOR REMOTE CHART PROGRAMMING/TTL

The recorder chart drive system is designed to operate from an external frequency source including TTL levels.

The chart can be run at time rates other than those built into the recorder. This mode is obtained by placing the REMOTE LOCAL switch (on rear panel of recorder) in position REMOTE and applying a pulse train (Table 3-2), to pins 6 and 7 of the remote control connector; pin 7 is common.

TABLE 3-2
PULSE TRAIN REQUIREMENTS

PULSE STATE	VOLTAGE REQUIREMENTS
0 (Lo) state	Voltage is + 0.5 V or less.
1 (Hi) state	Voltage is + 3 to 10 V maximum.
Minimum pulse width:	100 microseconds

Pulse frequencies up to 10 kHz may be used if the chart speed selector switch is set to limit the actual chart movement speed to 50 cm/min. or less. A 50 cm/min. paper speed can be obtained by applying a 500 Hz external frequency and setting the chart selector switch to position 30 cm/min.

The formula is: $\text{Chart Speed} = \frac{F \text{ Hz} \times S}{300}$

Where: F = external frequency in Hz
S = selected chart speed

When the external frequency is set to 300 Hz, the chart drive will run at the speeds marked at the top panel selection switch. If the external frequency is increased (or decreased) by 10%. The actual chart speed will be 10% faster (or slower) than the setting on the panel selector switch.

EXAMPLE: The selector switch is set to 30 cm/min. and the external frequency is set to 330 Hz (a 10% increase). The chart paper will now run at a 33 cm/min. rate.

NOTE

Changes of external frequency affects all selector speed rates by the same factor.

The recommended maximum chart speed for start stop operation is 50 cm/min. If the frequency is "swept" (no start/stop), it is possible to run faster than 50 cm/min: however, the sweep rate must be gradual enough to assure accurate mechanical tracking.

SECTION 4 THEORY OF OPERATION

4.1 GENERAL

DC input signal to the recorder is first filtered and then amplified by the preamplifier to a level which is less susceptible to noise and interference. This conditioned signal is then applied to the servo amplifier which continuously compares it to the feedback signal developed by the servo potentiometer.

The difference between these two signals is either a positive or a negative error signal that is amplified and used to drive the servo motor (which is coupled to the servo potentiometer) in a direction that reduces the error signal to zero. Since the recorder pen is mechanically coupled to both the servo motor and servo potentiometer, its position on the chart represents an accurate and continuous permanent record of the input signal (see Figure 4-1).

4.1.1 DC Power Supply

AC line voltage is reduced by stepdown transformers and is converted to dc, by solid state rectifiers and regulators. A stable dc voltage, generated by a compensated zener diode, is used as a reference for the servo potentiometer.

4.1.2 Pen Drive System

A pen drive mechanism is driven by a dc servo motor. This motor controls the servo potentiometer and the recorder pen by means of a gear-driven servo drum assembly. The pen is attached to a drive cable, which is wrapped around--and secured to--the drum. As the drum rotates, the pen is moved across the chart paper.

4.1.3 Chart Drive System

In the chart drive system, an internal crystal oscillator generates pulses which are divided down by integrated circuit logic. The chart speed switch selects the appropriate pulse rate to drive the stepper motor at the desired speed.

NOTE

The crystal frequency is not a function of line frequency; therefore, chart speeds are completely independent.

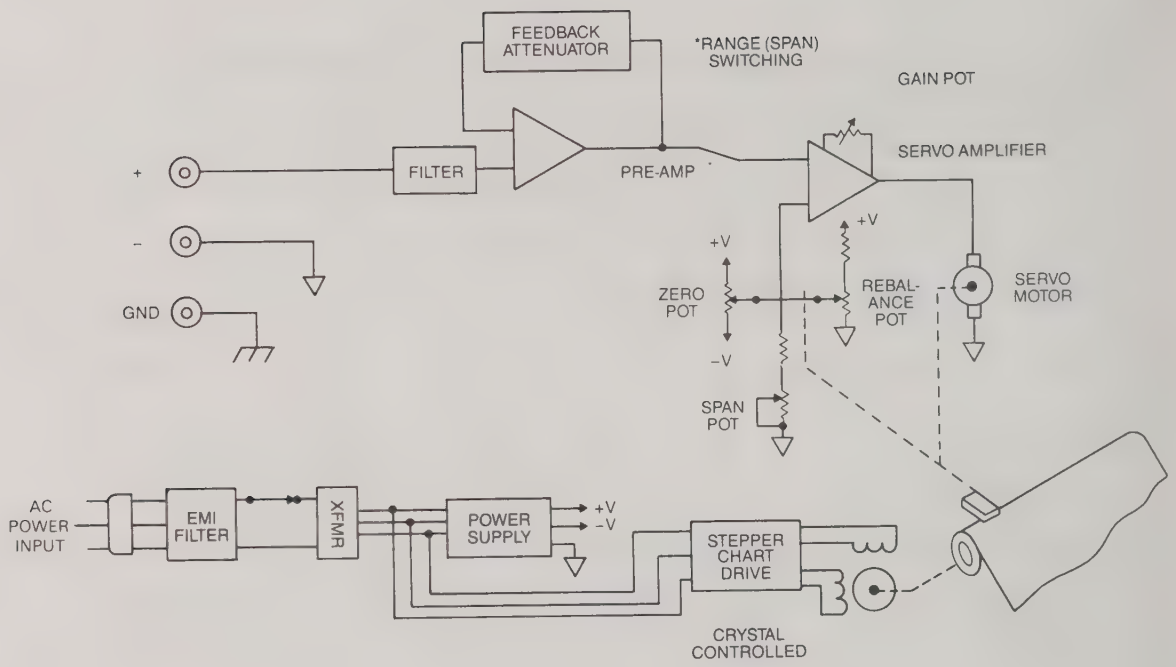


Figure 4-1. Input Signal Block Diagram

SECTION 5 SERVICE INFORMATION

5.1 MAINTENANCE

The OMEGA Laboratory Chart Recorders are sturdy, long lasting, precision instruments which require little servicing or maintenance. Nevertheless, the performance of a few maintenance procedures will promote optimum performance and help to extend the life of the instrument.

5.1.1 Routine Cleaning

The exterior surfaces of the recorder should be cleaned periodically by wiping with a soft damp cloth. Water may be used to remove ink, etc; however, solvents should not be used as they may damage or destroy the finish.

5.1.2 Pen Care

Chart paper and pens have been carefully matched for optimum writing and minimum "bleed." Substitutions could cause improper writing. To prolong pen writing life, keep the pen tip covered when not in use.

NOTE

If a pen is left uncapped for a long period of time and dries out, it may be revitalized by dipping it in water for a few seconds.

5.1.3 Free Chart Paper Movement

Do not press down or otherwise manually force the paper hold down bracket. This action could pinch the paper as it feeds over the sprockets. Firm tension on the paper roll and the correct alignment of the paper hold down bracket are required for proper chart paper feed.

5.2 CALIBRATION

The OMEGA Laboratory Chart Recorders are designed for long term, trouble free operation. However, after periods of long term use, the recorder sensitivity may degrade and the following calibration procedures may have to be performed.

> WARNING
>
> Calibration procedures should only be performed by a trained and qualified technician. Since there are potential shock hazards associated with the performance of these procedures, the technican should exercise every precaution to avoid contact with live electrical components.

5.2.1 Gain Adjustment

The gain adjustment controls the servo loop gain or the "dead band" of the recorder. It can be reached through a hole in the bottom of the recorder marked GAIN (see Figure 5-1). If it is set too high, the pen will buzz. If it is set too low, the pen will be sluggish.

1. Short the (+) and (-) inputs (red and black connectors on the back of the recorder) and set the pen to center scale by rotating the ZERO control.

2. Rotate the GAIN control clockwise until the pen buzzes. Back off the GAIN control by rotating it counterclockwise until the buzzing stops.

3. Recheck the adjustment by moving the pen over the full scale using the ZERO control. If the pen buzzes at any point, turn the GAIN control counterclockwise until the buzzing stops.

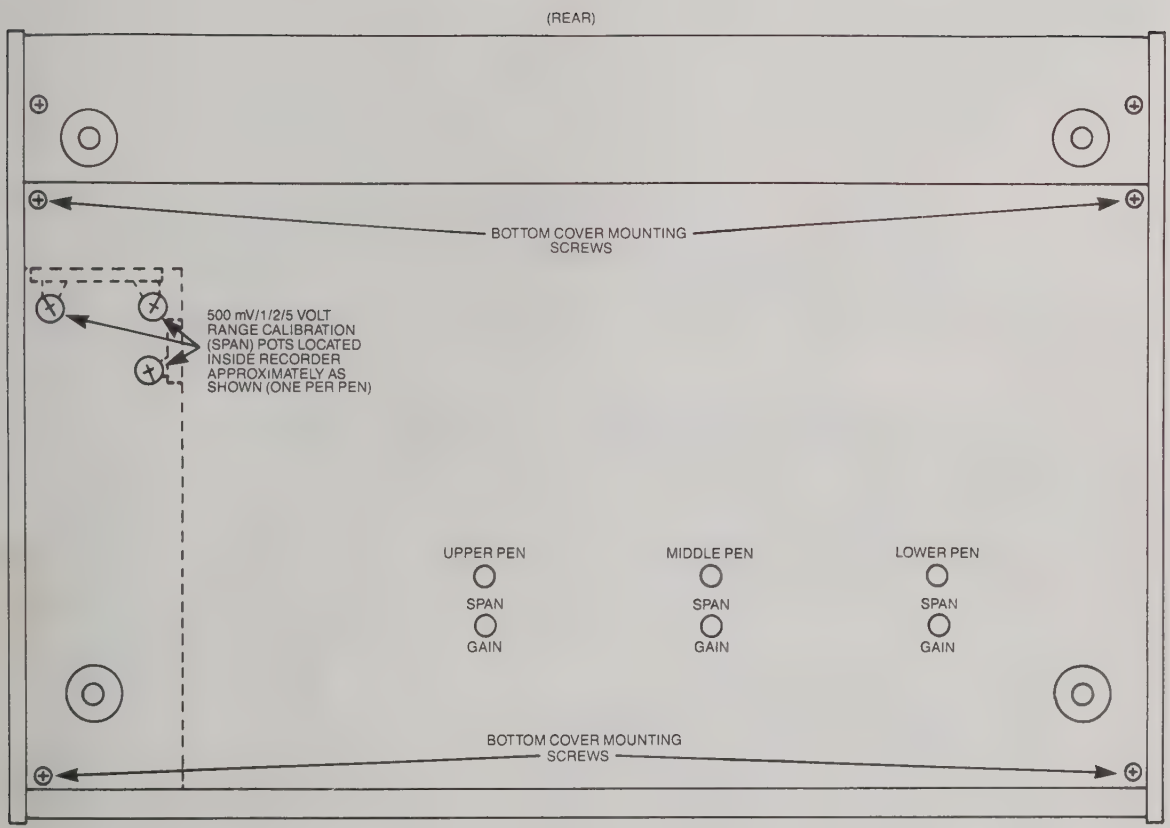


Figure 5-1. Gain/Span Access Location

5.2.2 Offset Adjustment

NOTE

The offset is factory adjusted and should not need re-adjustment under normal use of the recorder. This calibration procedure is not recommended for customer use.

This adjustment reduces the zero shift between input spans to a minimum value. Performance of this adjustment requires that the recorder input be switched between a short circuit and a 50 kilohm resistor. Connect a 50 kilohm resistor across the recorder's input binding posts (+ and -) or use a shorting jumper wire to short the input.

1. Allow the recorder to warm up to operating temperature (30 minutes is suggested).
2. Remove the bottom panel of the recorder (see Figure 5-1).
3. Connect the short across the input binding posts.
4. Set the INPUT SPAN switch to position 100 mV.
5. Use the ZERO control to set the pen to mid-scale.
6. Set the INPUT SPAN switch to position 1 mV.
7. Return the pen to the setting established by Step 5 with the use of the Eo potentiometer in the pre-amp circuit (see Figure 5-2).
8. Remove the short which was connected in Step 3.
9. Return the pen to the setting established by Step 5 with the use of Io potentiometer in the pre-amp circuit.
10. These adjustments are interactive. Therefore, it will be necessary to repeat Steps 3 through 9 until minimum pen movement is achieved.
11. Remove the 50 K resistor and the shorting wire.

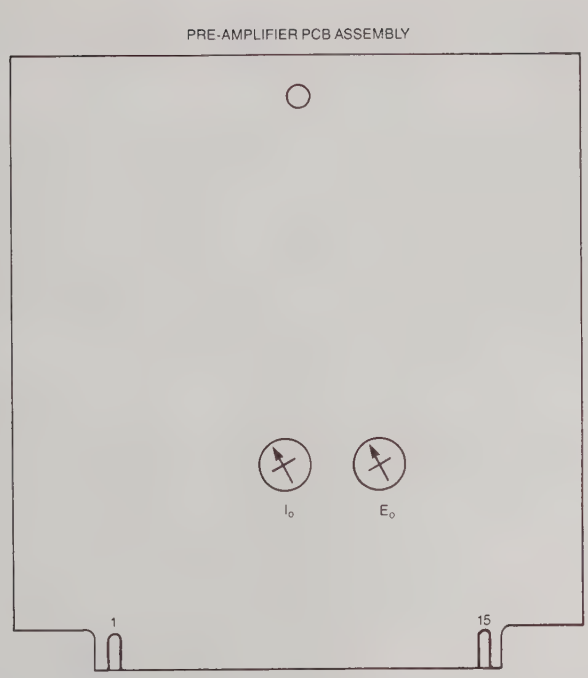


Figure 5-2. Offset Adjustment Location

5.2.3 Span Calibration

This procedure enables the technician to adjust the recorder, so that a calibrated full-scale input signal will move the pen up to the full width of the chart. The first span adjustment can be reached through a hole in the bottom of the recorder marked SPAN (see Figure 5-1).

The second span adjustment is normally not necessary and the bottom panel must be removed to gain access to this adjustment control.

1. Allow the recorder to warm up to operating temperature (about 30 minutes is suggested).

2. Set recorder to position 1 mV, and set the signal source to zero output.

3. Carefully set the pen to zero by rotating the ZERO control.

4. Apply a dc signal (0.1% accuracy) 1 mV to the input.

5. Insert a screwdriver into the hole in bottom of recorder marked SPAN. Rotate the control until the pen is positioned at 100% on the chart.

6. Check all input spans for proper inputs for 100% + 0.5% deflection. Check recorder zero for all ranges; reset as necessary.

NOTE

If spans for ranges 200 mV through 5 V do not deflect to 100% + 0.5%, continue with the following steps:

7. Remove the bottom panel and set the INPUT SPAN switch to position 1 V. Check recorder zero; reset as necessary.

8. Apply a 1 V dc signal (0.1% accuracy) to the input.

9. Adjust the potentiometer located on the 4 lug terminal strip near the range switch (on the inside of the recorder) for 100% + 0.5% pen deflection.

10. Check all inputs from 200 mV to 5 V for proper inputs at 100% + 0.5% deflection. Check zero for all ranges; reset as necessary.

5.3 TROUBLESHOOTING

OMEGA Laboratory Chart Recorders are designed for years of trouble free operation. On those sporadic occasions when operating difficulty is encountered, consult the Troubleshooting Chart in Table 5-1 to isolate and correct the malfunction.

TABLE 5-1

TROUBLESHOOTING CHART

	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
1.	POWER indicator does not light, and the recorder is inactive	Disconnected ac power source	Connect ac power source.
		Blown fuse	Replace the fuse.
		115/230 Volt Select Switch is in the wrong position.	Check switch on the rear panel.
2.	POWER indicator is ON, but the recorder is inactive.	Disconnected signal input leads	Check all input connections
		Loose preamp/ servo driver circuit board	Tighten the circuit board.

TABLE 5-1 (continued)

	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
2.	(continued)	Gain is set too low	Adjust the GAIN control through the hole in the bottom of the recorder.
		Defective preamp/ servo driver circuit board	Replace the preamp/servo driver circuit board.
		Defective servo motor	Replace the servo motor.
3.	Excessive deadband	Gain is set too low	Adjust the GAIN control through the hole in the bottom of the recorder.
		Excessive common-mode signal	Connect the ground terminal to the source of the common-mode signal.
		Recorder ground is not connected to the signal source ground	Provide a common ground for the third wire (green or green and yellow) in the power cords.
		Pen drive cable is too loose	Tighten pen drive cable

TABLE 5-1 (continued)

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
4. Noise on pen trace	Noisy input signal from the signal source	Check the signal source.
	Extremely noisy power line	Check the power line.
	Gain is set too high	Adjust the GAIN control through the hole in the bottom of the recorder.
	Recorder ground is not connected	Provide a common ground for the third wire (green or green and yellow) in the power cord.
	Defective bearing in the servo motor	Replace the servo motor.
5. Pen trace has isolated steps.	Dirty pen carriage slide rod	Clean slide rod
	Servo driver gain is set too low	Adjust the GAIN control through the hole in the bottom of the recorder.
	Defective servo motor	Replace the servo motor.
	Defective servo potentiometer	Replace the servo potentiometer.

TABLE 5-1 (continued)

	SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
6.	Pens will stop moving, but will catch up, if physically pushed	Defective bearing in the servo motor	Replace the servo motor.
7.	Pen writes poorly	Depleted ink supply	Replace the pen.
		Pen tip has dried out	Revitalize the pen by dipping it in water for a few seconds.
8.	Chart Drive is Inoperative	Loose or defective power connections	Check and repair the power connections to the stepper transformer.
		Defective chart drive motor	Replace the chart drive motor.
		Defective stepper chart drive circuit board	(A) Check the ac power connections to the circuit board. (B) Check the dc voltages on the circuit board. (C) Replace the stepper chart drive circuit board.

TABLE 5-1 (continued)

SYMPTOM	PROBABLE CAUSE	CORRECTIVE ACTION
9. Continuous chart drive	Defective capacitor across chart ON-OFF switch	Replace the capacitor.
10. No chart drive in a particular chart speed	Loose or defective connections at the chart speed selector and/or the circuit board connector	Check and repair the connections.
	Defective component on the circuit board	Replace the component or replace the stepper chart drive circuit board.

SECTION 6 SPECIFICATIONS FOR THE 555, 585, AND 595 RECORDERS

CHART SIZE:	250 mm wide; 30 meters long
CHART SPEEDS:	1, 2, 3, 4, 5, 6, 10, 12, 15, 20 and 30 CM/MIN. and CM/HR.
WRITING METHOD:	Disposable Fiber-tipped pen
POWER:	115/230-V ac ± 10% at 50 or 60 Hz
WATTAGE:	555 21 W, nominal 585 29 W, nominal 595 38 W, nominal

SPECIFICATIONS (continued)

FUSE:	Slo-Blo, 0.3A for 115 V; 0.15A for 230 V (single and dual channel models) Slo-Blo, 0.6A for 115 V; 0.3A for 230 V (triple channel models only)
FULL SCALE SPAN:	1 mV through 5 V (10:1 attenuator to 50 V on each channel)
INPUT:	Floating ±100 V, single ended
INPUT IMPEDANCE:	20 Megohms through 100 mV; 2.5 Megohms through 5 V
DAMPING:	Critically damped on all ranges (requires no adjustment)
ZERO ADJUST:	Continuously adjustable from -100% to +100% on each range; right-hand zero is standard.
ACCURACY	
LINEARITY:	±0.5%
DEADBAND:	±0.1%
REPEATABILITY:	±0.1%
PEN RESPONSE:	1/2 second, F/S
COMMON MODE REJECTION:	80 dB minimum DC to 60 Hz 100 V, maximum

SPECIFICATIONS (continued)

PHYSICAL DIMENSIONS:	H: 5.5" (139.7 mm) x W: 17.75" (450 mm)	
	D: 14" (355.6 mm) x	
WEIGHT:	Model 555	12.5 lbs (5.7 kg)
	Model 585	14.5 lbs (6.58 kg)
	Model 595	17 lbs (7.7 kg)

6.1 ACCESSORIES

DESCRIPTION	PART NUMBER
CHART PAPER, 250 mm	0100-0105
MODEL 555	
PEN, Short nib, blue	0100-0105
PEN, Short nib, red	0100-0106
PEN, Short nib, black	0100-0107
PEN, Short nib, green	0100-0108

DESCRIPTION	PART NUMBER
MODEL 585	
PEN, Short nib, blue	0100-0105
PEN, Short nib, red	0100-0106
PEN, Short nib, black	0100-0107
PEN, Short nib, green	0100-0108
PEN, Long nib, blue	0100-0109
PEN, Long nib, red	0100-0110
PEN, Long nib, black	0100-0111
PEN, Long nib, green	0100-0112

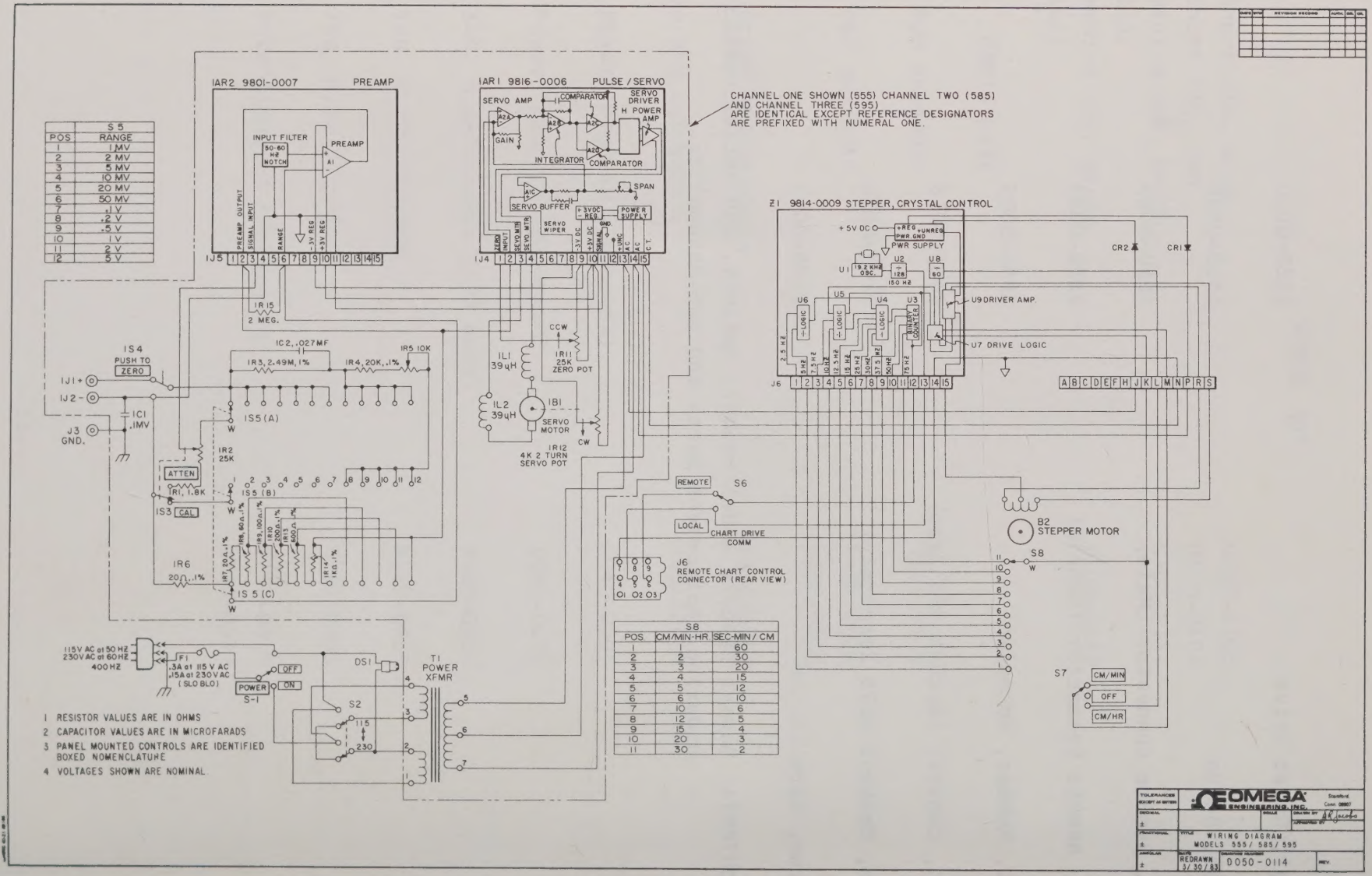
PEN, Short nib, blue	0100-0105
PEN, Short nib, red	0100-0106
PEN, medium nib, black (special)	0100-0131
PEN, medium nib, green (special)	0100-0132

6.2 PARTS LIST

Servo PCB Assembly	9816-0016
Servo PCB Assembly	9816-0011 9816-0006
Chart Drive PCB Assembly	9814-0009
Pre-Amp PCB Assembly	9801-0007
Cord, Power, Plug-in (Domestic)	6040-0005
Cord, Power, Plug-in (European)	6040-0006
Fuse, 3AG, 0.6a Slo-Blo (595 only)	5120-0010
Fuse, 3AG, 0.15a Slo-Blo	5120-0007
Fuse, 3AG, 0.3a Slo-Blo	5120-0006
Servo Potentiometer (Rebalance)	4750-0022 4750-0037

Motor, Chart Drive	3525-0010
Motor, Servo	3510-0008
Pin, Remote Connector (Male)	2850-0065
Pin, Remote Connector (Female)	2850-0064
Feet, Rubber, Adhesive	2850-0005
Knob, Control (Except 595 Zero)	2405-0016
Knob, Control (595 Zero only)	2405-0014
Button, Zero Switch	2405-0007

IMPORTANT: Always specify model number, options, and serial number when ordering replacement parts and sub-assemblies.


IAR2 9801-0007 PREAMP
IAR1 9816-0006 PULSE / SERVO
CHANNEL ONE SHOWN (555) CHANNEL TWO (585) AND CHANNEL THREE (595) ARE IDENTICAL EXCEPT REFERENCE DESIGNATORS ARE PREFIXED WITH NUMERAL ONE.
Z1 9814-0009 STEPPER, CRYSTAL CONTROL
S5
POS RANGE
1 1MV
2 2 MV
3 5 MV
4 10 MV
5 20 MV
6 50 MV
7 .1V
8 .2 V
9 .5 V
10 1 V
11 2 V
12 5 V
S8
POS CM/MIN-HR SEC-MIN/CM
1 1 60
2 2 30
3 3 20
4 4 15
5 5 12
6 6 10
7 10 6
8 12 5
9 15 4
10 20 3
11 30 2
1 RESISTOR VALUES ARE IN OHMS
2 CAPACITOR VALUES ARE IN MICROFARADS
3 PANEL MOUNTED CONTROLS ARE IDENTIFIED BOXED NOMENCLATURE
4 VOLTAGES SHOWN ARE NOMINAL
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WIRING DIAGRAM MODELS 555/585/595
REDRAWN 3/30/83
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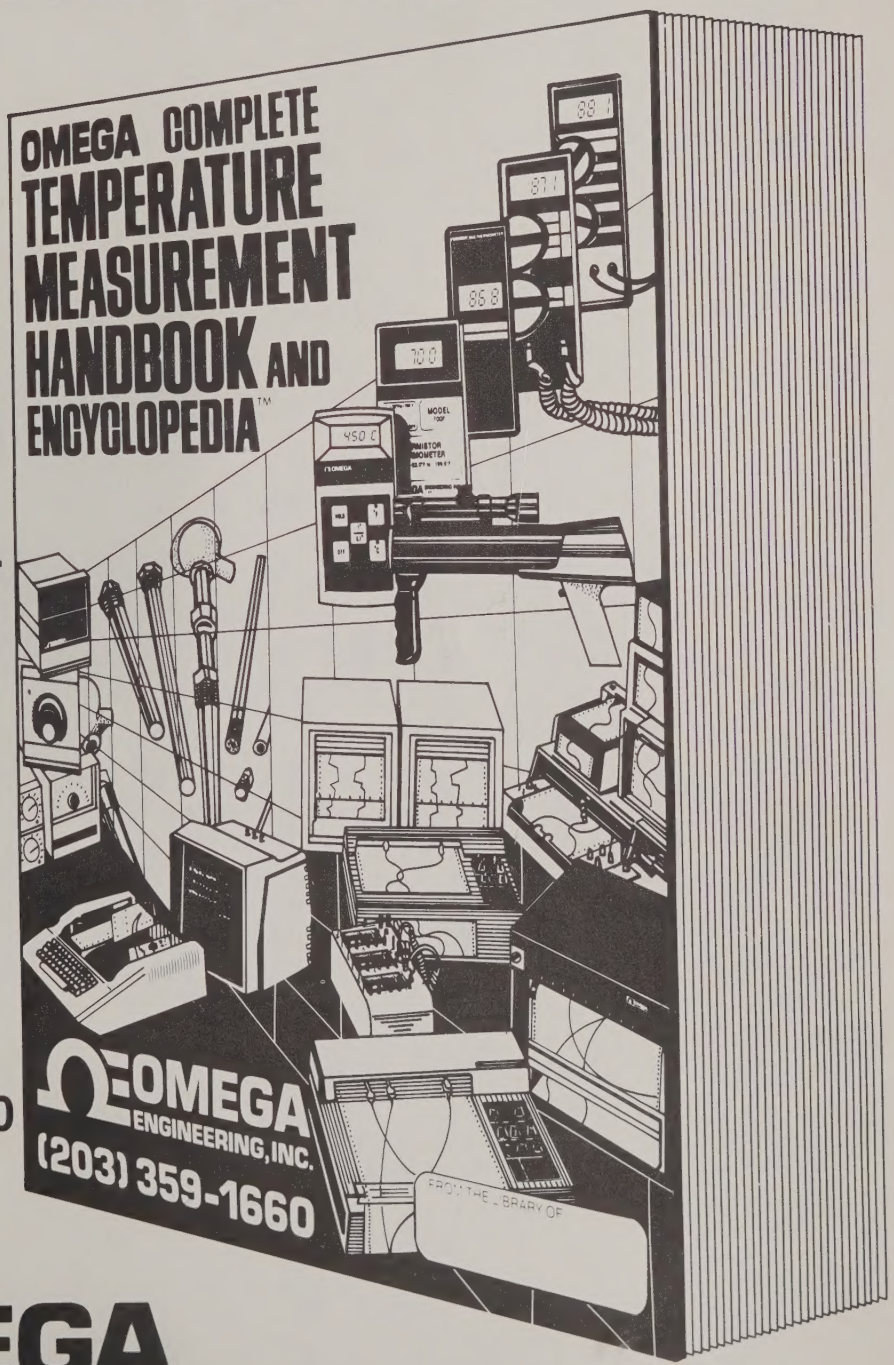

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1. Returnee's name, address, and phone number.
2. Model and Serial numbers.
3. Repair instructions.

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